


Article

The Development of Land Readjustment Models in Serbia and South-East Europe

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Abstract: Land readjustment (LR) is increasingly applied as a tool of urban policy implementation in many countries of the world. In Serbia, LR is a new tool that is being introduced into the legal system and into planning practice, from which a significant contribution to the urban development of the country is expected. Countries have different models of LR, which are adjusted to the particular conditions specific for that society. This is to be expected, having in mind the specificity of each country. This paper presents the development of land readjustment models which are adjusted to Serbia, but could also be used in the countries of South-East Europe, considering that the predominant conditions are similar. The most important item in this process is defining the key elements which determine the nature of the model: the existence and appropriateness of the urban plan and the distribution of benefits from increased land value. The paper also presents a case study of LR implementation on the basis of defined models, after which an analysis of the outcomes is presented. It is concluded that by applying the LR models presented, numerous significant issues that occurred in the past can be solved.



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1. Introduction

Although it has been used in numerous countries for some time, land readjustment (LR) has been causing more interest in recent years, which is obvious from the substantial attention it is receiving in the international literature [1–7]. On the other hand, there is a significant number of countries and regions that do not implement LR or do not have developed models.

LR is widely known as an important and effective land management instrument for re-arranging land parcels and creating a new parcel structure which is in accordance with urban planning principles. Many authors have defined LR in slightly different ways but the essence is the same. “The basic idea behind LR is that a re-parcelling of land takes place by way of swapping land positions between the landowners, without any transactions taking place, while part of the land will be used for public services and infrastructure” [8]. “LR provides serviced building plots with proper public infrastructure within a reasonable period of time with no or almost no need of public subsidization” [9]. “Land readjustment is a complex process of arranging construction land where existing parcel structure is annulled and the new one is created, with the principle of maintaining property rights and value” [10]. This is an organized process that is carried out in the procedure prescribed by law by the competent institutions. During land readjustment, the existing parcels of construction land are connected into one whole readjustment mass, after which new parcels are created in accordance with the principles of urban planning. When the area, which is intended to be construction land, contains parcels which are not suitable for construction due to their size and shape, they are transformed into parcels that have a shape and size

which satisfy the urban planning parameters for construction. This is usually land intended for construction by the corresponding urban plan, but which previously had a different purpose: agriculture, industry, or even construction but with an unfavorable plot structure.

In the LR process, land for public needs is provided, such as land plots for streets, green areas, parks, kindergartens, schools, health institutions, etc. At the same time, legal property relations concerning the land are solved, which is a prerequisite for the successful realization of the whole procedure. The construction of public infrastructure can also be part of the LR process.

In Serbia, LR is a new land management tool which is being introduced into the legal system and planning practice, and from which a significant contribution to the urban development of the country is expected. Legal regulations are currently being made to define this field. The law on planning and construction, which introduced LR, was passed in 2011 [11]. It defines only the basic provisions, and the adoption of a by-law is envisaged that would more closely define the method for carrying out LR and all the technical details in relation to it. On one hand, the by-law has not been adopted yet because of the vigilance and inertia of the authorities, and, on the other hand, due to the complexity of defining such a demanding process. Bearing in mind the complexity of the entire LR process, it would be of great help to develop and legally define models for its implementation which will be adequate and applicable in the existing conditions in Serbia. Each country where LR is implemented has a unique model that is adjusted to the relevant circumstances specific to that country [12], which is to be expected, having in mind “the specificity of each country in terms of socio-economic relations, history, tradition, current state of urban development, legislation, legal system, economy, needs, natural characteristics, etc.” [13]. Evidence supporting how LR is affected by the particularities of each country in terms of land readjustment can be found in the literature dealing with this topic [9,14–20].

Having that in mind, the aim of this study is to analyze the particularities of Serbia that influence the LR process and to present a model which is adjusted to the specific conditions of Serbia and other countries in South-East Europe. Further, the paper aims to contribute to LR literature by emphasizing the significance of scrutinizing the specifics of countries or regions in order to maximize the positive effects of LR. It would be very dangerous to simply copy the model from another country, even if it is successful in that country, and apply it. This could jeopardize the whole concept of LR and consequently deprive that country of all the positive effects such a tool could bring. This paper presents possible models, based on which the entire system of land readjustment is developed and adjusted to Serbia, and which could also be applied in other South-East European countries, considering that the predominant conditions there are similar. Specifically, illegal construction, the lack of urban plans, and unresolved property legal relations, are a large problem in Serbia and, indeed, the whole region [21–25]. One of the main objectives of this study was to analyze the characteristics of Serbia that are relevant to LR, in order to deliver a model of implementation. Model development implies definition of a series of logically systematized and chronologically synchronized phases of the LR process. Some of these phases are crucial since they divide the LR process into different models. This paper focuses on these critical phases.

Despite a substantial literature dealing with LR, there is not much research that focuses on practical problems in the implementation of LR. The objective of this paper is to, in addition to the theoretical development of the LR model, demonstrate a practical application in a specific study area that includes problems related to the on-site implementation of LR. Section 2 presents the international concept of LR, and its place and objectives in urban development, with a review of the relevant literature. Section 3 explains the research methodology used in this study. Section 4 provides a detailed explanation of the models according to which it is possible to implement LR in Serbia and in the region. The focus is on analyzing the criteria and defining the conditions in order to determine which model will be implemented. It also explains the model chosen as the representative one in more detail, with a description of all of its characteristics. Section 5 summarizes the results of

the empirical study (case study), i.e., the implementation of LR according to the model described in the previous section for a specific area of land. It is necessary to outline that this case study serves as an illustration of this model, and so not all of the details of the elements and calculations are presented. Section 6 draws relevant conclusions.

2. Role and Objectives of Land Readjustment in the International Context

The process of urban development can be described in terms of three main phases, planning, land management and the construction of infrastructure [26]. LR is focused on the second phase, land management, although it can also be a part of the planning phase, which includes the design of spatial and urban plans. So the process of designing plans includes LR, in such a way that it can greatly improve its quality. “LR involves a blend of urban planning and real estate principles such as local planning laws, urban design principles, real estate appraisal techniques, participatory and communicative planning approach, and land surveying” [27].

The general objective of LR is to reallocate and equip land in order to adjust it to an urban plan through the active participation of landowners in a given area, for the purpose of more efficient urban use [12]. Such projects have multiple objectives:

- Urbanization of new areas;
- Reorganization of already urbanized areas;
- Integration of large complexes;
- Rehabilitation of areas destroyed in natural disasters or during war destruction.

To put it simply, the concept of LR as a tool for implementing urban planning aims to encompass rural or unorganized urban land, which is most often improperly divided, and to recompose it, thus achieving an optimal balance between public and private needs in accordance with urban requirements.

LR is present in many countries worldwide as an urban planning tool. Its formal beginnings are found in Germany. The first law that regulated LR was brought about by the Mayor of Frankfurt in 1902 [28]. Therefore, Germany is considered the initiator of organized and legally regulated LR. In Japan, LR was widely used in areas destroyed by earthquakes, and it was especially important after World War II in the reconstruction of large urban areas destroyed by war [29]. Nowadays, Japan is the country with the largest urban areas developed by LR. This method spread from Japan to other Asian countries: South Korea, Thailand, Taiwan, etc. Over time, the significance of this method of urban development in Japan has grown so much that, according to some authors [30,31], it has become a synonym for urban development. France has a very different way of implementing LR, adapted to its own social system [32]. In West Australia a type of land readjustment is implemented, land pooling, and this also has its own specificities [33,34]. There are also examples of not so successful implementations of LR, such as in Finland [35,36], where LR did not find a successful application, primarily due to rigid legal constraints.

Considering most of the specified literature [12,29–36], the main differences in LR models can be noticed. Table 1 shows the crucial characteristics of LR models in five mentioned countries.

Table 1. Summary of differences in LR models.

	Germany	Japan	France	West Australia	Finland
Mandatory existence of urban plan before LR	Yes	No	No	No	Yes
Distribution of benefits from increased land value among landowners	No	Small	Yes	Yes	Yes
Influence of LR on urban planning	Small	Yes	Yes	Yes	No
Construction of infrastructure as a part of LR	No	Yes	Yes	Yes	No
Preservation of social structure	Mostly	Mostly	Yes	Mostly	Mostly
Mandatory for landowners to participate	Yes	Yes/No	No	Yes	Yes
Landowners are actively involved in decision making	No	Yes/No	Yes	No	No

From all of the above, it is clear that LR has a role in various social and economic systems, and the great attention it has had in international literature for a long time contributes to this [7,37–40]. Despite the effectiveness of the basic concept of LR, it is clear that it is necessary to make certain adjustments to the specific conditions in a particular country in order to make it successful.

3. Materials and Methods

Research methodology consisted of a series of interviews with different parties related to LR, using the experiences obtained in pilot projects, and relaying experience in similar and associated fields such as land readjustment, cadastre and urban planning.

As part of the LR model's development, interviews with many stakeholders were conducted. These interviews included many different participants such as government officials from the Ministry of Construction, Transport and Infrastructure, local officials from local government responsible for urban planning and construction, experts from international organizations (GIZ GmbH), officials from the Republic Geodetic Authority, and scholars in the field of urban planning, legislation, surveying and geodesy. All of these interviews contributed to a comprehensive understanding of both the current situation and the expectations of LR in the sense of solving accumulated problems. Besides offering a more comprehensive understanding, the interviews pointed out specific individual problems and issues that must be taken into account in the LR model. Furthermore, by actively participating in an official governmental work group for LR legislation, the authors of this study gained additional insight concerning all aspects of introducing LR in Serbia.

In the process of introducing LR in Serbia, several pilot projects were conducted. The aim of these pilot projects was to examine the possibility of applying LR and to identify the key points in the process. They were conducted in a controlled environment, which was not entirely representative in terms of real-life conditions. Nevertheless, the pilot projects provided valuable insights concerning crucial phases of the process and potential problems that may occur.

Serbia and other South-East European countries have a long tradition of applying land consolidation [10,41]. Since LR originated from land consolidation by adopting its main principles and applying them to urban land in Germany at the beginning of the 20th century [28], it is appropriate to use experiences gained during the extensive application of land consolidation in this part of the world. Land consolidation and LR are similar in their mechanism of application. Both instruments share the same principles of merging all parcels into one whole, and afterwards dividing it in accordance with the goal that needs to be achieved. In land consolidation the main goal is to maximize agricultural production, while the main goal of LR is to implement urban design principles. Using the knowledge and experience obtained in land consolidation that is specific to Serbia and other South-East European countries, many problems and issues that may emerge in LR can be prevented and addressed.

Like any other land management tool, LR is closely connected to a cadastre and the data contained in such public records. LR is partly “a cadastral procedure” and cannot be carried out without the data contained in cadastral records. Those data have to be up-to-date and reliable. In Serbia and other South-East European countries, the reliability and up-to-datedness of cadastral data may often be an issue. Since this region was part of the eastern bloc, where the registration of private property was not apriority, the cadastral system faced numerous challenges when the political system was changed [42]. Furthermore, the well-known war events in this part of Europe additionally postponed the reform of the cadastral system. Since then, much has been done concerning the modernization and reformation of the cadastre and many problems regarding the reliability, up-to-datedness and consistencies of cadastral data have been solved [43]. Even so, the quality of cadastral data is still questionable, and this has to be taken into account. Having this in mind, it is imperative to foresee the new survey of the LR area in order to have updated cadastral data. The time and cost of cadastral update may be high, but the gain will be much higher

because the benefits and charges of land owners are based on this data. When developing an LR model that is applicable in such circumstances it is imperative to use experiences related to the cadastre. Cadastral works, such as renewing cadastral surveying, updating cadastral data, implementing modern technologies in existing data sets, etc., have been conducted on a large scale in recent years [44–47]. Experiences gained during this work have been implemented in the development of the LR model, since many issues concerning cadastre are expected to arise.

The implementation of urban plans is facing numerous problems in Serbia [48]. Most are related to the appropriateness of the urban plans, illegal construction, unplanned settlements, unresolved legal property relations and other similar factors. Such circumstances threaten to jeopardize the economic development and prosperity of countries in this part of Europe. It is very difficult to obtain a serviced building plot, whether for an industrial facility, commercial building or a private house. LR is perceived as one of the instruments that can help solve some of these problems. Since some mechanisms have been developed and used to overcome these problems over the past two decades, these experiences are very valuable, and as such have been implemented in developing the LR model.

4. Land Readjustment Models

Land readjustment is a compound process, a complex of different measures, which together make a unique system. The LR process is carried out through multiple hierarchically synchronized phases involving a variety of different fields, such as the law, spatial and urban planning, geodesy, economics, organization and construction.

One of the main characteristics of LR is its high degree of dependence on the specific conditions within a country or society, resulting in the need for different application models. These models are mutually very different, although they rely on the same basic principles of LR [10,12], such as:

- Provision of land for public purposes;
- Provision of adequate plot structure;
- Serving private interests;
- Serving public interests.

LR models must rely on these principles and at the same time they must take into consideration all factors that characterize the country for which the models are being defined. Since model development implies defining all the phases of the LR process, it is essential to identify the crucial ones which determine the model that will be applied. These crucial phases are the junctions of the whole LR process, and they are dependent on the characteristics of individual country. For that reason, this section focuses on them. As a result, the models are presented in the form of flowchart, which shows the part of the whole LR process containing the crucial phases.

Taking into account the current state of spatial planning in Serbia, the need to develop a model of land readjustment is even more pronounced. It is evident that one of the main problems is the inability to implement urban plans, as well as their inadequacy. The development of applicable LR models would contribute considerably to solving these problems.

The basic elements that influence the development of an LR model in Serbia are:

- The existence and appropriateness of the urban plan;
- Consideration of the distribution of benefits resulting from the increased land value

4.1. Existence and Appropriateness of the Urban Plan

Considering that LR, among other things, is a tool for implementing urban plans, it is to be expected that an appropriate urban plan exists, which is not always the case. If there is no urban plan, one needs to be prepared, and this can be done in two ways: parallel to the process of LR or independently of it. On the other hand, if an urban plan exists, it is necessary to carry out an analysis of the appropriateness of the prescribed solutions. Depending on the analysis carried out at this stage, it is possible to define the model that

will be applied to an actual LR area. The known drawbacks of urban plans in Serbia and in many countries of the world are [13,21,22]:

- Outdatedness of cadastral data that were the basis for the spatial and urban plans;
- Neglect of the wishes and capabilities of land owners;
- Inapplicability.

Non-updated data are a generally known flaw of the cadastral system in Serbia and neighboring countries. Data recorded in the cadastre can significantly deviate from factual data on the ground. The appropriateness of an urban plan is directly affected by the level of outdatedness of cadastral data, since the urban plan is made based on the data recorded in the cadastre. Urban planning experts who prepare urban plans are required to use current official data and there is no possibility for them to revise these data. Taking this into account, a compulsory phase of the LR process in Serbia and other countries in South-East Europe must be the update of cadastral data.

During LR, a phase called “determination of the factual situation” is conducted. This phase of the LR process is taken from land consolidation and it is basically the updating of cadastral data only in the LR area [49]. It is conducted as an official legal procedure by an official governmental committee. The process is similar to the “renewal of cadastral surveying” but with some differences. It is much faster and more efficient, which is important for LR. Thanks to this phase, updated data for the LR area are obtained, especially in terms of property rights over land, and also in terms of the actual state on the ground. The updated data can significantly differ in comparison with the data from the cadastre that were used to make the urban plan. The main question is: would the experts who made the urban plan make it differently if they had the updated data? The main purpose of the appropriateness analysis for the existing urban plan, from the perspective of outdatedness of the cadastral data, is to determine the extent to which the updated cadastral data affects the approved plan design.

When designing urban plans, phases are foreseen in which plan designs are exposed to public insights, during which all landowners and interested parties can make remarks and objections. Local government, which proposes the urban plan, is legally obligated to announce the public insight for that plan. Unfortunately, despite the obvious motive, the participation of landowners is very weak. Often, they are not well informed about the public hearing or are not aware what it means. They do not have the awareness of the significance of their participation since they are not obligated to take part in that process, which is voluntary. The consequence of such a process is that urban plans are being adopted without the proper insight from the people that area who are affected the most [50].

On the other hand, during the LR landowners are invited individually to participate indifferent phases and they are actively involved in the whole process. In addition to this, they can also be organized into an association that can represent their interests. This possibility, together with an active campaign carried out by the local government, motivates them to become more active and understand that taking active involvement is primarily in their interest. The significance of the active involvement of landowners in the LR process is even greater when considering one of the basic characteristics of this process, namely the preservation of the social structure. This basically means that the same landowners will be in charge of construction and further development of that land, so their capabilities need to be taken into consideration. In other words, it is unwise to implement solutions for which land owners do not have opportunity or interest. For example, it is illusory to foresee the construction of facilities that, according to their structure, are such that they exceed the financial capabilities of the landowners. The aim of the appropriateness analysis of the existing urban plan is to determine to what extent those wishes and capabilities influence the solutions defined by the urban plan.

An additional characteristic of urban plans in Serbia is their insufficient applicability. The general consensus of the professional public is that “one of the problems is the adoption of urban plans that are not enforceable in practice. It is evident that there is no implementation of urban plans and urban development in general if urban plans are not

designed in such a way that they can be carried out on the ground” [48]. The objective of the appropriateness analysis of the existing plan from the perspective of applicability is to test the plan’s design in terms of applying the prescribed solutions. All aspects of the urban plan are reassessed and appropriate conclusions are drawn.

An appropriateness analysis is carried out by the LR committee. It consists of experts in the fields of law, surveying and geodesy, urban planning and land evaluation. The LR committee is appointed by the local government, but it is obligated to be an independent professional body. The committee is in charge of execution of the entire LR process in accordance with the law and professional rules. Since this phase is the most critical in the whole process, the role of the LR committee is especially important when it comes to the appropriateness analysis of the urban plan. They must analyze all the elements that influence the appropriateness of the urban plan and assess the benefits and cost of its eventual modification. This is a very delicate decision, because no plan is perfect and there are always some things that could be improved, but the cost of modifying the plan can often exceed the benefits. The procedure for changing the urban plan can take a lot of time and can be costly. That can significantly lengthen the time needed for conducting the LR and raise its costs. That is why the decision to modify the urban plan must be made only in cases where the benefits significantly outweigh the costs of such a procedure.

In order to reach the best decision, the committee can perform a number of activities. They can organize public meetings with the landowners in order to discuss all aspects of the existing plan’s solutions and the potential benefits of its modification. The committee is not obligated to obey the requests and opinions of the landowners, but it is irrational not to take them into consideration and try to implement them in the final solution. After all, the landowners are the ones that will implement the urban plan. Furthermore, the committee can engage outside experts and organizations to analyze some of the aspects they do not feel comfortable with to help them reach the best decision.

Depending on the existence and appropriateness of the urban plan, there are four obvious possible models represented in Figure 1.

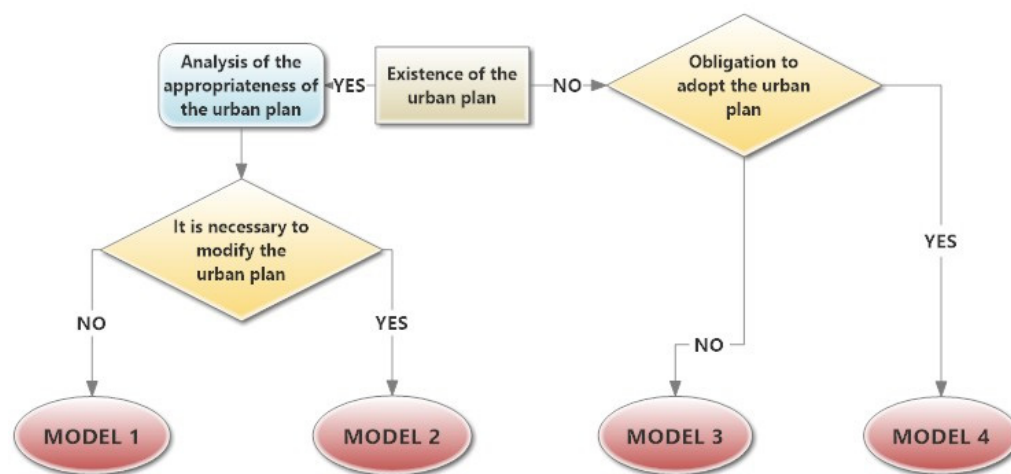


Figure 1. Flow chart of LR process depending on the existence and appropriateness of the urban plan.

4.1.1. Model 1

If there is an existing urban plan and if the appropriateness analysis showed that it does not need to be changed, Model 1 is used for further implementation of the LR procedure. It is important to note that this decision does not mean that the existing urban plan is ideal, but that it has been estimated that it is good enough and that the benefit of changing it would be small in comparison with the cost of launching a procedure for modifying the urban plan. This model implies the implementation of the LR in its basic sense—as a tool for implementing adopted urban plans. This model is also the simplest in terms of time and costs.

The input data for this model are existing cadastre data, urban plan, and information on the wishes and capabilities of landowners. Outputs of the Model 1 are new building plots that are in accordance with the rules from urban plan, and a new cadastral survey.

4.1.2. Model 2

If the conclusion of the appropriateness analysis concludes that the existing urban plan is not appropriate, the procedure for its modification is initiated. Model 2 involves the implementation of LR in a more complex form. The LR process needs to be linked with the procedure for modifying the urban plan, which is conducted simultaneously. In both procedures it is necessary to identify the phases and actions that must be connected and ensure their synchronization. This is, above all, an organizational challenge, since it is necessary to harmonize the chronologies of individual phases and actions in both processes, while optimizing whole processes in order to eliminate unnecessary time losses and redundant activities. The decision to initiate the procedure to modify the urban plan is one of the most important and difficult decisions that is made in the LR process. Its significance is reflected, above all, in the fact that the total costs are increased. In general, apart from the costs, the time for the completion of works is also extended, and the need is created for a much wider engagement of professional bodies at the level of local government, in addition to a greater possibility of complications. Because of all this, the decision to initiate the procedure for modifying the urban plan must be made only in the case of the inadequacy of the existing urban plan, to the extent that implementing such a solution would significantly reduce the existing development potential of the land.

The input data for this model are existing cadastre data, urban plan, and information on the wishes and capabilities of landowners. Outputs of Model 2 are a changed urban plan, new building plots that are in accordance with the rules from urban plan, and a new cadastral survey.

4.1.3. Model 3

This LR model is applied in areas where the legal regulations do not prescribe the design of urban plans. These are mostly rural settlements, or possibly individual settlements at the far fringes of larger cities. This is a non-typical model for the application of LR. However, it would be extremely irrational to reject the potential benefits that such a tool can bring to areas that are not envisaged in the development of urban plans. The need for development in such areas is evident, just as is the benefit of applying LR.

Considering that this is a specific LR model, it is necessary to incorporate elements that will replace the lack of a detailed plan necessary for its implementation and to provide a comprehensive arrangement of the area. The LR area needs to be observed as one whole, in terms of needs, possibilities and the application of all urban planning principles. Technically, the first step is to determine and separate the areas for public use by designing a “public area plan”. After that, it is necessary to define the “partition rules” for the rest of the land in order to create correctly shaped building plots. This type of implementation of LR requires a much larger engagement of the project team, i.e., intensive involvement of the planning experts, which increases the costs and extends the time needed for its implementation. On the other hand, when the development of the building land is viewed as a unique process, this manner brings certain advantages. In a unified procedure, all elements necessary for the arrangement of building land are solved while allowing the application of urban planning rules in areas that would not have this possibility without the implementation of LR.

The input data for this model are existing cadastre data, and information on the wishes and capabilities of landowners. Outputs of the Model 3 are defined urban planning principles, new building plots that are in accordance with defined urban planning principles, and a new cadastral survey.

4.1.4. Model 4

In areas where there is no urban plan, and its adoption is obligatory by legal regulations, Model 4 is applied. Since the new urban plan has to be designed, these two procedures should be linked to a larger extent than in Model 2, which is modified.

Model 4 enforces a high degree of interconnection between LR and designing the urban plan at all stages in which this is relevant. As with Model 2, it is necessary to identify the phases and actions that must be connected and ensure their synchronization, as well as the chronology of their execution in order to eliminate unnecessary time losses and redundancy of work. Considering that this is a larger scope of connectivity, the need to apply organizational elements in this model is even more pronounced.

The first actual input parameter for the design of an urban plan is the mere fact that LR will be carried out. This opens up more opportunities and freedom to find suitable planning solutions, to the extent that they can change the whole concept of the plan. Another important input parameter is the data obtained when determining the factual situation and taking geodetic measurements at the site. With this insight into the updated property rights and situation on the ground, the team of experts designing the urban plan receives a much better overview and important information for planning an adequate and applicable urban plan.

Despite the obvious similarity between Model 2 and Model 4 they are essentially very different. In Model 2 the urban plan is modified to a lesser extent. Usually only some specific factors are changed, but not the essence of the urban plan. In Model 4 the process of planning is completely dependent on some of the LR phases, not only technically but essentially. This fact could have a decisive influence on the whole concept of the urban plan. The entire process is much more robust and comprehensive. The resulting final design of the urban plan can, therefore, significantly differ from the final design that would be achieved without the LR.

The input data for this model are: existing cadastre data, information about wishes and capabilities of landowners. Outputs of the Model 4 are: urban plan, new building plots that are in accordance with the rules from urban plan, new cadastral survey.

4.2. *Consideration of the Distribution of Benefits from the Increased Land Value*

In the LR process, the value of the land increases significantly. The land used for other purposes does not have the structure of the plots that meets the urban development criteria. Such land is transformed so that it becomes suitable for building according to the urban plan. The increase in land value is obvious and the main question is what happens with that increase. Should it belong to the landowners, or should the local government use it for further improvement of that area? As a result, there are two possible alternatives.

The first alternative is that all the benefits belong to the landowners. They will obtain land that is more valuable than the land they owned before LR. All the profits from the increased land value are proportionally allocated to the landowners in proportion to their land value before LR. The gain for the local government is the land for public infrastructure, which is obtained without any expense. If the LR was not implemented the local government would have to expropriate the land for public needs and pay full compensation to the landowners. In this case the landowners are required to bear the expenses of constructing public infrastructure according to current legal regulations.

The second alternative is that the landowners get land that is exactly the same value as the land they owned before LR. All additional building plots are assigned to the local government. By selling those building plots on the free market, the local government will obtain funds for building the public infrastructure on the LR area. The gain for the landowners, in this case is the fact that they would not have to pay the “land development fee” and that the land plots obtain the required public infrastructure. That fee is obligatory for everyone in normal circumstances and the funds obtained in that manner are intended for financing the construction of public infrastructure.

Which of the two alternatives is implemented depends on a number of factors. One of these is the amount of land value increase. If that increase is not sufficient enough to finance the LR process and the construction of public infrastructure, clearly the second alternative is not feasible. This is due to one of the crucial principles of LR that imposes the requirement that landowners cannot obtain a lower land value than they had before. Another factor is the opinion of landowners. If local government is given the right to sell the building plots on the free market, the landowners would have to agree. This kind of process should not be compulsory, in order to preserve the confidence of landowners in local government. An additional element that could influence the choice between these two alternatives is the capacity of the local government to carry out the whole process of selling the building plots. Many smaller local government bodies do not have the capacity to ensure the efficient sale of land in a reasonable amount of time. All that has been said implies that the decision should be carried out individually for each particular LR area in accordance with the specific conditions of that LR area.

The decision on the distribution of benefits from the increased land value is reached by the LR committee, in the same way as for the appropriateness analysis. The committee must take into account all elements that are elaborated in this section and conduct additional interviews with landowners and local government officials concerning this matter.

Depending on the distribution of benefits from the increased land value, there are two possible sub-models. The second part of the flow chart for the LR process for all four possible models is represented in Figure 2.

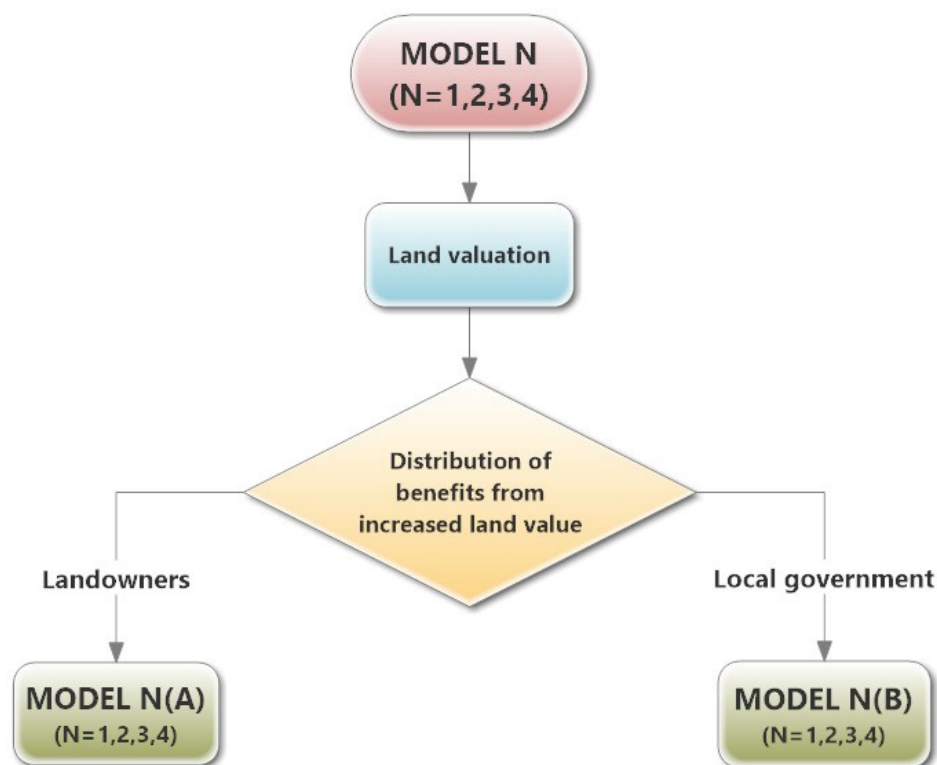


Figure 2. Flow chart of LR process depending on distribution of benefits from increased land value.

4.2.1. Model N(A)

If the decision is made that local government benefits from the increase in land value, the further flow of the LR process will take place according to Models 1A, 2A, 3A or 4A. The local government will have, beside the public areas, a number of building plots that will be sold on the free market. These plots must be sold as soon as possible. The objective of selling the plot is to finance a part of the costs of the LR procedure and in particular to finance the costs of building the public infrastructure in the LR area. In this case, the consent of most of the landowners is required.

In order to be implemented there are a few restrictions that must be imposed. Firstly, infrastructure financed in this way must be intended mainly for use by the inhabitants of the LR area. Since it is financed by land that was in their possession, it would not be fair to finance infrastructure intended for a wider area. Secondly, the value of building plots intended for market should not be so high that it decreases the value of the land distributed to landowners to below the old value (before LR). Each landowner must obtain at least the same value he/she had before LR. Thirdly, if the increase in land value is so high that it exceeds the cost of the LR procedure and infrastructure, the remainder will go to the landowners rather than the local government.

The output of Model N(A) is, besides those already specified, financial resources for public infrastructure.

4.2.2. Model N(B)

When the benefit from the increase in land value belongs to the landowners, the LR process will take place according to Models 1B, 2B, 3B or 4B. Each landowner will get a part of the increase in land value in proportion to the value they have entered. This means that, after the exclusion of areas for public purposes, the entire readjustment mass will be distributed to landowners in accordance with the value of their land before LR.

Model B is applied in those cases where the increase in land value is relatively low or when the consent of the majority of landowners cannot be ensured. This manner of land distribution is legally the easiest because it does not require the interference of the local government on the market for building land. Therefore, the procedure is simplified, and at the same time the risks of possible speculative actions or any doubts about the transparency of the procedure of the sale of building plots on the market are eliminated. The downside of this model is the inability to provide funds for financing the costs of the LR procedure and, more importantly, the inability to provide funds for financing the construction of infrastructure.

The construction of the infrastructure would be funded in the usual way, as well as in areas where LR is not implemented. Landowners would be obliged to pay the standard “land development fee”, possibly reduced by the amount needed for public purposes. The downside of this model is a much slower implementation of the urban development measures by local government. This can be especially negative in poorer communities where local governments are not financially powerful.

The output of Model N(B) may be, besides the ones already specified, higher land value for the landowners. This is only the case if the value of land that was given to landowners increased comparing to value of land they had before LR.

4.3. Land Readjustment Model with the Modification of the Urban Plan and Allocation of the Benefits to the Local Government—Model 2A

Model 2A will be explained in more detail due to the fact that this is one of the most complicated models in terms of its connection with changes in the urban plan and the distribution of benefits from the increased land value. Additionally, the case study presented in this paper was conducted by applying this model.

This model is applied in cases when there is an urban plan for the LR area, but the analysis of appropriateness determines its modification is necessary, and when it is decided that the benefit of increased land value goes to local government. On the basis of the above sections, this is Model 2A.

The characteristic of this model is that the key activities of LR must be linked to the process of modifying the urban plan that takes place separately. Unlike Model 4, connection with the modification of the urban plan depends on the planned scope of modifications. At the same time, it is necessary to allocate construction plots that will be given to the local government for further sale in order to provide funding for the LR procedure and construction of infrastructure. The complexity of this model is evident, since many factors that are important for maximizing the potential of the LR area must be taken into account.

Bearing in mind the complexity of this model, cooperation between two project teams (the LR project team and the one working on the modifications of the urban plan) is necessary. Thanks to that cooperation and, based on the predetermined parameters, finding the optimal solution through the iterative procedure is possible. It is necessary to estimate the scope of changes to the urban plan through the identification of the elements that are being modified and accordingly determine the level of freedom that could be applied in the draft design of the LR.

Besides the technical challenges concerning cooperation between the two project teams, there are some legal issues that must be taken into account when applying this model. There is a separate legal procedure that must be followed when urban plans are changed. That procedure sometimes requires a significant amount of time and could, potentially, lengthen the duration of the whole process and cause problems from the organizational and financial aspects. Those problems should be prevented by appropriate planning of the LR process throughout all its phases.

After the completion of the LR process and the establishment of a real estate cadastre, the local government sells the building plots that are intended for that purpose on the free market. With the funds provided in that way, the local government finances the construction of public infrastructure in accordance with the agreement with the landowners.

5. Case Study

This section of the study aims to illustrate the model presented in the previous section and to summarize the results based on a case study area where LR was implemented. Since this is used as an illustration, not all details of the elements and calculations used will be presented, as they would unnecessarily burden the content and aim of this paper.

The LR area is located on the outskirts of the city of Niš, in the municipality of Palilula, and it includes parts of the cadastral municipalities Bujanj and PasiPoljana. This is a peripheral part of the city where expansion of the city area is planned. The border of the LR area and the borders of the cadastral municipalities are shown in Figure 3 on an orthophoto base.

5.1. Existing Cadastral and Urban Plan Data

The total surface of the LR area is 235,573 m². The planned land use is diverse. According to the already existing urban plan, apart from residential buildings and roads, commercial blocks and blocks for social institutions are also planned (Figure 4). Moreover, the expected increase in the land value is significant, which allows for more possible solutions from the aspect of the distribution of benefits from the increase in land value.

The cadastral data was updated by means of the phase of LR called “determination of the factual situation”. It was determined that there are 15 landowners on the LR area, of which 14 are private parties and one is the local government. The total number of parcels is 117, of which 94 are owned by private parties. Figure 5 shows the cadastral parcels before LR.

There are 11 private houses in the LR area, one with a building permit, and 10 without proper documentation. LR does not imply demolition of these houses, but rather the formation of building plots in accordance with the urban plan, which will enable the legalization of these facilities as a special procedure. The distribution of building plots will be such that the current owners of the existing houses will obtain the plots on which these facilities are located.

Through the analysis of cadastral data, it is obvious that the area owned by the local government will not be sufficient for all public areas, mostly streets, intended by the urban plan.

On the basis of the field work, the data obtained during the process of determining the factual situation and the analysis of the urban plan, several problems were noticed. The first problem is the existence of a residential building in block number 7. That block is, according to the urban plan, intended for commercial use. In addition to block 7, the land use of blocks 3 and 11 is also commercial. The second problem is the size of block 4, which is in disagreement with the prescribed plot sizes.

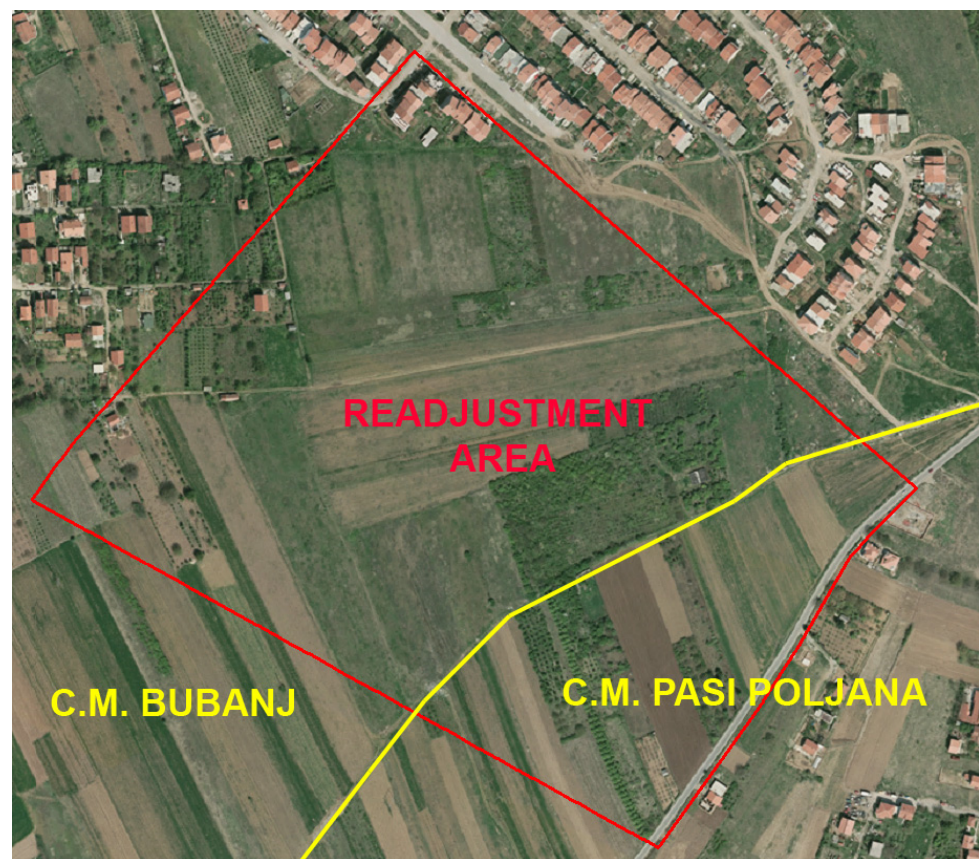


Figure 3. Readjustment area.

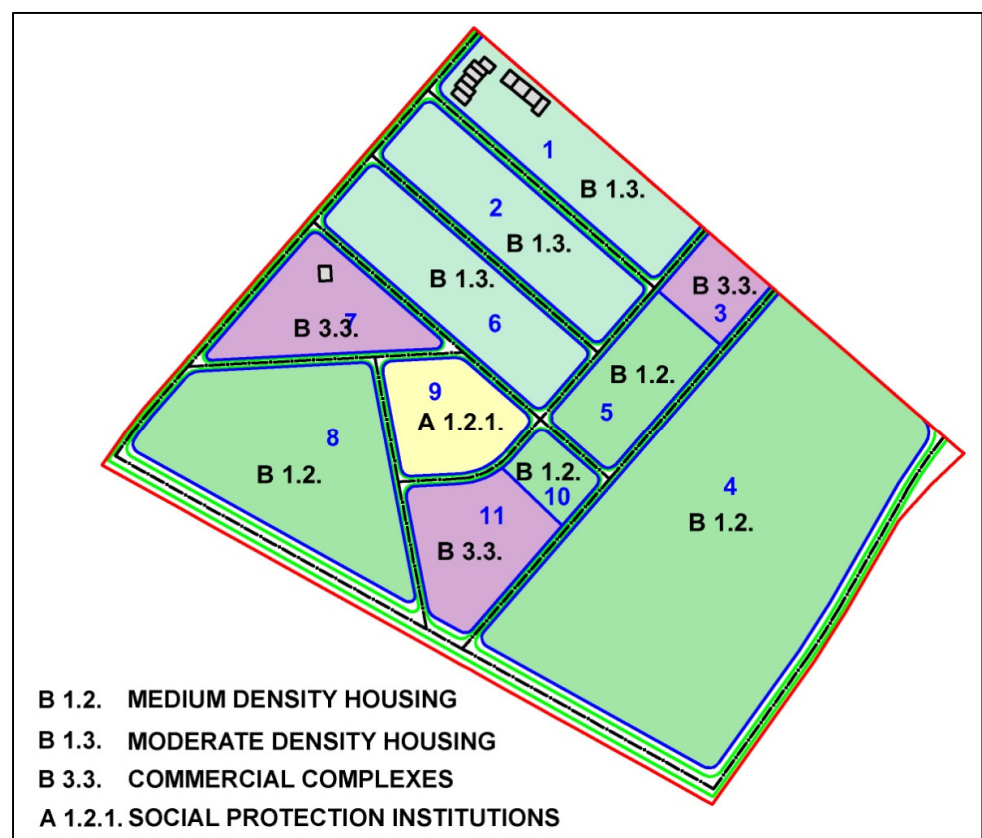


Figure 4. Planned land use according to the urban plan.

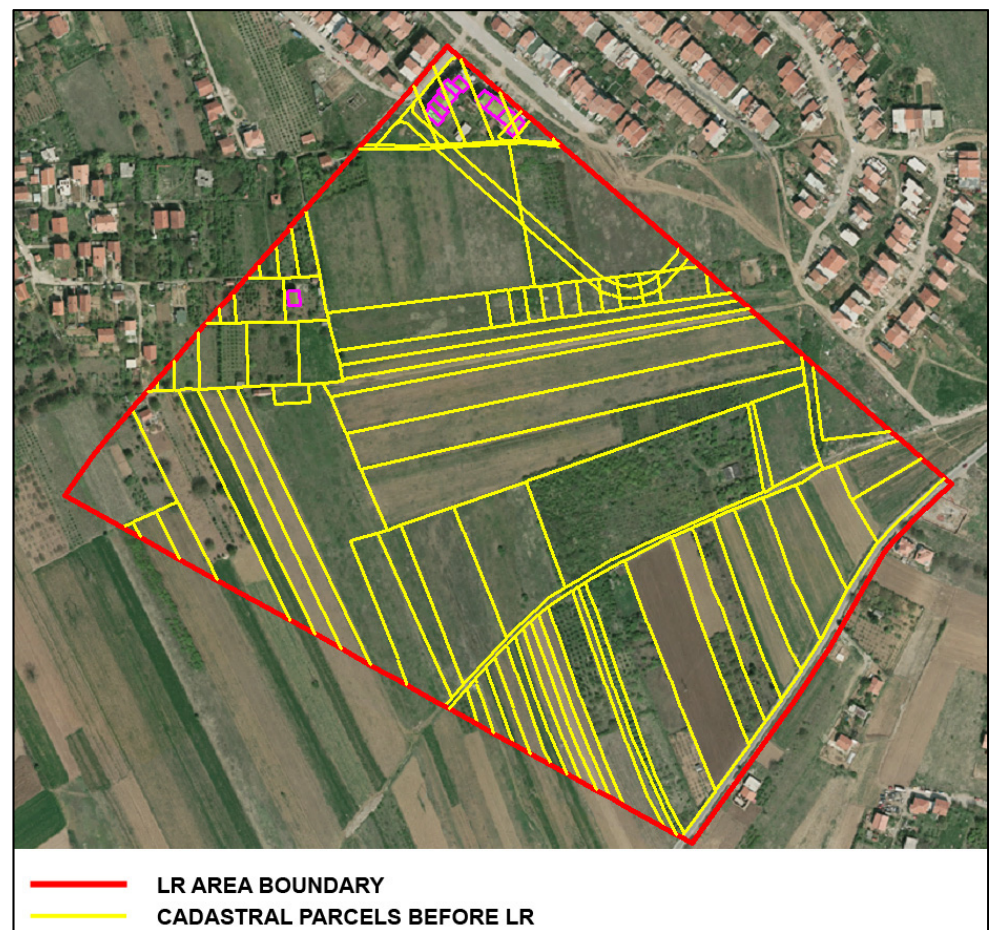


Figure 5. Cadastral parcels before LR.

5.2. Modification of Urban Plan

Based on the appropriateness analysis of the urban plan (Section 4.1), it was decided by the LR committee to conduct the modification of the urban plan in order to overcome the problems mentioned. Changes to the urban plan consist of changing the land use of block 7 into moderate density housing in the urban area (B.1.3.) and dividing block 4 into three smaller blocks by adding new roads. The change of the land use of block 7 was not caused only by the existence of a residential building, but also by the fact that there are already two blocks with commercial land use in the LR area (block 3 and block 11) and the need for housing is more pronounced. Changes to the urban plan are shown in Figure 6.

Based on the difference in land value before LR and after LR, it is obvious that the increase in land value is significant (Table 2). This allows for certain profits from the increased land value to go to the local government for financing the public infrastructure, while at the same time preserving the basic principle of LR that each landowner obtains at least the same value in relation to the one he/she has entered.

During the phase of considering the distribution of benefits from the increased land value (Section 4.2), it was decided by the LR committee that a part of the profit should belong to the local self-government in order to build some of the infrastructure in the LR area. The decision was that the local government should get the blocks with commercial land use (block 3 and block 11). This means that the landowners will be partially exempted from paying the land development fee, in proportion to their share in the readjustment mass.

This solution was selected taking into account the local government's ability to sell this land on the market through bids or other legally established procedures to interested companies. It is much easier for local government to sell land intended for commercial use

than housing, because it also solves some other problems in the domain of its activities, such as economic development, unemployment, etc.

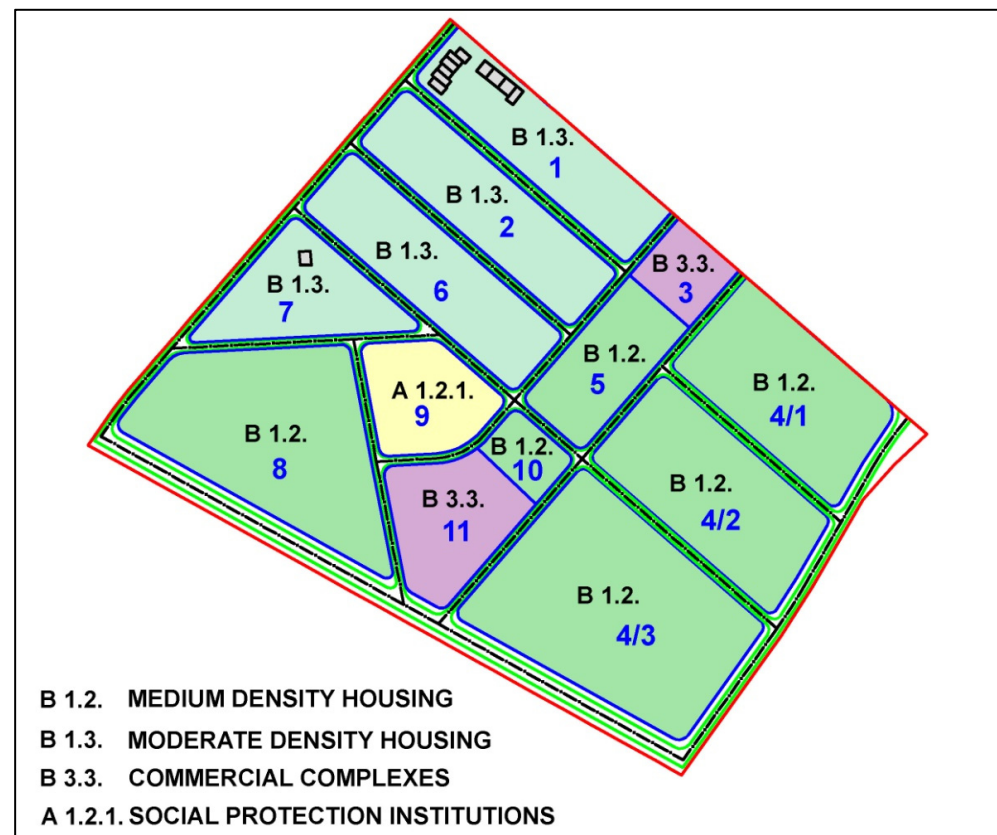


Figure 6. Modifications of the urban plan.

Taking into account the decisions that were made (modification of urban plan and allocation of the profit to the local government), it is obvious that the model applied to this LR area is model 2A.

Land evaluation was conducted before and after the LR in accordance with current legislative and professional practice used for land evaluation in general in Serbia by licensed real estate appraisers.

5.3. Distribution of Land

The distribution of new plots in the LR area includes defining the borders of the streets (and other public areas) and building plots distributed to the landowners. The borders of public areas were defined in the urban plan. Public areas in this LR area include streets and block 9, where the ownership rights are retained by the landowners until further notice. The reason for this is the fact that block 9 is intended for use by a much wider urban area, so it would not be fair for the owners in this LR area to give up land that will be used by a much larger number of inhabitants. In the further procedure, the local government will expropriate this plot, but it will not have problems with its shaping, as this has been done through the process of LR.

The criteria for allocating building plots to landowners were their wishes and the layout of their property before LR. The constraints imposed by the urban plan through the construction rules in which the minimum size and width of plots per blocks were prescribed were respected. A distribution plan was made using the criteria for plot allocation and land value data. The goal of the distribution plan was to distribute the land values of the individual landowners to the blocks, so that all the blocks are filled and all the land values of the landowners are distributed.

The goal was to form the maximum number of small plots, as many as the construction rules and block shapes allowed, because in this way the value of building plots is maximized. The total number of new plots is 237. Figure 7 shows the layout of the new plots. Each color represents individual landowner.



Figure 7. New plots on the LR area.

Table 2. Summary of numeric data for LR area.

	Before LR	After LR
Number of parcels	117	237
Number of owners	15	15
Area–private ownership (m ²)	224,647	165,950
Area–local government (m ²)	10,926	69,623
Total land value (€)	1,572,529	2,210,850
Private ownership land value (€)	1,572,529	1,934,892
Local government land value (€)	0	275,958

Table 2 shows a summary of the numeric data for this LR area. The number of parcels after the LR is almost double. This is due to the fact that the land before LR was mostly used for agriculture, which implies bigger parcels. The number of owners is the same before and after LR because the principle of LR, i.e., preservation of the social structure, is fulfilled. The area in private ownership significantly decreased after LR. That is a result of allocation of land to the local government for streets and for selling in order to cover a part of the costs for the local infrastructure.

As seen in the table, the increase in land value is significant and, for the whole area, is around 40%. The value of building parcels that are shaped according to the urban plan is much higher per m² than the value of the parcels before LR. This allowed part of the land to

be assigned to the local government in order to cover a significant part of the infrastructure costs. The amount of 275,958€, which is the value of the land that the local government will sell, is going to be deducted from the land development fee that the landowners need to pay. Each of the owners will get the deduction in proportion to the area they have renounced for this purpose.

5.4. Case Study Discussion

The characteristics of the LR area shown in this paper were: a significant increase in the value of the land, different land use intended by the urban plan, the existence of public areas in the service of a wider urban area and the insufficient appropriateness of the urban plan (to a lesser extent). On the basis of these characteristics of the LR area, it was determined that LR should be carried out according to the model involving modification of the urban plan and allocation of benefits to the local government. Practical implementation has shown the appropriateness of the application of this model.

The landowners received properly sized and shaped building plots. The decrease in the area of the plots for all landowners is significant, but the value of the new building plots is much higher. Moreover, they were granted exemption from the payment of part of the land development fee, and a share in the ownership of a plot for public purposes that will be expropriated in the future.

The local government has received, besides the implementation of the urban plan on part of its territory, the area for the streets without compensation and land that can be sold on the free market. Selling land will provide some of the funds for financing the construction of public infrastructure, which is always a better solution than waiting for the landowners to pay land development fees. In this way, the necessary funds are gained and quicker, more efficient, and therefore cheaper, public infrastructure is built.

6. Discussion

The paper presents the importance of LR as a tool that can significantly contribute to urban development. The goal of finding optimal models that can be applied in Serbia and the countries of South-East Europe was achieved by conducting a series of interviews with different parties related to LR, using the experiences obtained in pilot projects, and relying on experience in similar and associated fields such as land readjustment, the cadastre and urban planning. The development of LR models is based on setting up a system for the LR process in which, based on recognized parameters, optimal application models are defined. In accordance with the conditions prevailing in Serbia, key stages of the process are identified in which, on the basis of the analyzed criteria, decisions on the application of a particular model are made.

The key elements that determine which LR model will be used are the appropriateness of the urban plan and the distribution of benefits from the increased land value. These elements have caused the most problems in urban development in Serbia and its surroundings. Using LR mechanisms, these problems can be solved effectively and to the satisfaction of both landowners and local governments. Nevertheless, caution is needed when selecting the model and avoiding the trap of overestimating the capabilities of LR in terms of its actual range. We need to be aware that LR is a tool that helps the quality and implementation of urban plans rather than a magic wand that will solve all problems.

As a consequence of analyzing the key elements, four main models of LR were developed, together with two sub models for each, which resulted in a total of eight models. Each of them has the potential for application, depending on the specific circumstances of each individual LR area.

The case study shown in this paper was conducted by applying one of the most complicated and demanding LR models. There was a need to modify the urban plan and it was decided by the LR committee that part of land value increase belongs to the local government for financing local infrastructure. In addition, diverse land use further complicated the whole process. In the end, it was shown that, by applying the right LR

model, implementation of the urban plan could be conducted to the satisfaction and benefit of all parties involved: the landowners and the local government.

Defining the proper model by identifying the key elements is of great importance, above all in countries that are only just introducing LR as a new way of implementing urban plans. It is expected that such a new tool will raise distrust among landowners, especially when considering the history of South-East European countries. In the past, landowners were often dissatisfied and deprived when it came to similar tools, due to a political system that was unfavorable towards private property. That is why LR must be thoroughly prepared and must ensure the full transparency and efficiency of the whole process.

7. Conclusions and Future Work Recommendations

The LR models presented in this paper are developed as a result of the need to adapt the LR process to characteristics of the individual LR area. The models are designed in order to cover all possible cases of LR areas that can be found in Serbia and other countries in South-East Europe. The analysis of crucial phases of the LR process aims to find which model is applicable in each individual LR area. By performing the analysis presented in this paper, step by step, the unambiguous solution to the problem is obtained, meaning that the adequate model is assigned to the particular LR area.

The objective of this paper was to present model development for successful LR implementation in Serbia and other countries in South-East Europe. Nevertheless, the methodology and the tools applied can be used in other countries and regions where the introduction of this land management instrument is expected. Using the experiences from countries that are successfully applying LR together with the analysis of the key elements of that specific country or region can be a winning combination for introducing LR in a way that would maximize the benefits of such a tool. The need to define the LR models in countries that will introduce LR in future could be the subject of upcoming research.

When it comes to future work on LR in Serbia, there is a lot to be done. As was mentioned, the whole legal basis has not been adopted but is expected to happen soon. There are more and more cases of practical implementation of LR in Serbia, although there would be much more if some technical problems caused by lack of legal basis were solved. Future research need to address other issues regarding LR, mostly concerning efficiency of the process and better connection with the system of urban planning. Besides this, the main issue that should be addressed in future research is the problem of determining the priority of LR areas. In other words, it is impossible to conduct LR everywhere where it is needed in a short period of time due to constraints in resources. What will be the criteria for selection of a priority LR area is an important question that needs to be answered.

The LR process is highly dependent on the specificities of each country in terms of socio-economic relations, history, tradition, current state of urban development, legislation, legal system, economy, needs, natural characteristics, etc. Having in mind that the world is rapidly changing in many of these aspects, it is inevitable that these changes will affect the way LR is conducted. Future research should focus on the role and the means of implementation of LR in changed circumstances.

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